



## **NASA STTR 2010 Phase I Solicitation**

### **T4 Goddard Space Flight Center**

As part of its mission, NASA needs advanced remote sensing measurements to improve the scientific understanding of the Earth, its responses to natural and human-induced changes, and to improve model predictions of climate, weather, and natural hazards. By using improved technologies in terrestrial, airborne, and spaceborne instruments, NASA seeks to better observe, analyze, and model the Earth system to aid in the scientific understanding and the possible consequences for life on Earth.

This STTR solicitation is to help provide advanced remote sensing technologies to enable future measurements. Components are sought that demonstrate a capability that is scalable to space or can be mounted on a relevant platform (Unmanned Aircraft Systems (UAS) or aircraft). New approaches, instruments, and components are sought that will:

- Enable new Earth Science measurements;
- Enhance an existing measurement capability by significantly improving the performance (spatial/temporal resolution, accuracy, range of regard); and/or
- Substantially reduce the resources (cost, mass, volume, or power) required to attain the same measurement capability.

## **Subtopics**

### **T4.01 Lidar, Radar, and Passive Microwave**

**Lead Center: GSFC**

**Lidar Remote Sensing Instruments and Components**

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Lidar instruments and components are required to furnish remote sensing measurements for future Earth Science missions. NASA particularly needs advanced components for direct-detection lidar that can be used on new UAS platforms available to NASA, on the ground as test beds, and eventually in space. Important aspects for components are electro-optic performance, mass, power efficiency and lifetimes. Key components for direct-detection lidar techniques (particularly efficient lasers and sensitive detectors) are solicited that enable or support the following Earth Science measurements:

- Profiling of cloud and aerosol backscatter, with emphasis on multiple wavelength as relevant to the Aerosol-Clouds-Ecosystems (ACE) mission. A particular interest is development of novel scanning telescopes capable of scanning over 360 degrees in azimuth with nadir angle fixed in the range of 30 to 45 degrees, scalable to spaceborne operation without imposing requirements for momentum compensation.
- Wind measurements (using direct-detection techniques). A particular interest is photon-counting detectors (either single element or array) with high quantum efficiency (>70%) and low noise (< 100 counts/second) to improve direct-detection wind profiling at 355 nm.
- Trace gas measurements. Specifically, novel (preferably wave-guided) reference gas cells with fixed long path-lengths of ~20 m up to 100 m for laser wavelength locking and calibration in fiber optic C-band and L-band for flight missions. The gas cells must be compact, lightweight, insensitive to vibration and deformation, low in excess insertion loss (<10dB preferred), free of multi-pass interference (MPI) and other spectral fringes that upset wavelength locking and calibration.

### **Radar Remote Sensing Instruments and Components**

Active microwave remote sensing instruments are required for future Earth Science missions with initial concept development and science measurements on aircraft and UASs. New systems, approaches, and technologies are sought that will enable or significantly enhance the capability for: (1) tropospheric wind measurements within precipitation and clouds at X- through W-band, and (2) precipitation and cloud measurements. Systems and approaches will be considered that demonstrate a capability that can be mounted on a relevant platform (UAS or aircraft). Specific technologies include:

- High-speed digital transceivers for cloud/precipitation radar remote sensing.
- Scanning Ka or W-band Doppler radar technologies with high sensitivity for clouds.
- High power, high-speed, low loss W- and Ka-band radar receiver protection.
- Ultra-low sidelobe pulse compression technologies for cloud/precipitation applications.
- Frequency selective surface for W-and Ka-band radar front ends.